

Area-Wide Chemical Control of Ticks

Insecticides, or as termed for ticks, acaricides, are the most effective way to reduce ticks, particularly when combined with the landscaping changes to decrease tick habitat reviewed earlier in this handbook. They provide consistent control, are relatively easy to apply, and are relatively inexpensive. Only small amounts of an acaricide applied at the right time of year are necessary. Chemical intervention should focus on early control of nymphal *I. scapularis* ticks, the stage most likely to transmit Lyme disease, by spraying once in May or early June. A fall application in October may be used to control adult blacklegged ticks (or in the spring if no fall application was made). Targeting lawn and woodland edges and perimeter areas near tick “hot-spots” or along the “tick zone” can minimize exposure. Some general points to consider if you spray for ticks:

- Applications can be made by the homeowner or by a commercial applicator.
- Spray once in the late spring or early summer for control of *I. scapularis* nymphs. For American dog ticks, an application can be made anytime after the adults emerge in the spring.
- A single application of most ornamental-turf insecticides will provide 85-90% or better control with some residual activity so multiple applications are rarely necessary. Some organic pesticide products are less effective, breakdown rapidly, and multiple applications may be required.
- Treat tick habitat only.
Spray areas where the lawn meets the woods, stonewalls, or ornamental plantings. Spray several yards into bordering woodlands, area of greatest tick density. Spray groundcover vegetation like *Pachysandra* near the home or walkways. Spray perimeter of areas of the yard often used by people (play areas, gardens, outside storage areas, walkways or paths to neighbors or mailboxes). Avoid herb, vegetable, and butterfly gardens.
- In parks and school athletic fields, restrict any applications to high-risk tick habitat. Spraying of open fields and lawns is not necessary.
- Use a product specifically labeled for controlling ticks. Some products are packaged as fertilizer-pesticide mixtures or mixtures of different pesticides (e.g., herbicide and insecticide).



Acaricides Used for Tick Control

There are several factors that will influence the selection of a specific chemical product. All pesticides sold must be registered with the U.S. Environmental Protection Agency (EPA) and the appropriate state pesticide agency for use within that state.

- The product must be labeled for area-wide tick control (see Table 3). Some products are General Use Pesticides and others are classified as Restricted Use Pesticides for commercial use only, available only to licensed applicators. Some products are labeled for brown dog ticks only or for ticks on surfaces, indoors, as a building foundation or perimeter treatment and are not labeled for use on ornamentals or turf. Check the label and ask for assistance. A licensed commercial applicator often will have a preferred acaricide that is used most frequently.
- The toxicity and environmental impact of the chemical. Chemicals differ in their toxicity to humans, wildlife, aquatic organisms and beneficial insects. While some general information is provided in this handbook, more detailed information can be obtained from sources listed at the end of chemical control section.
- The type of formulation and method of application. Both liquid and granular formulations have been reported effective against *I. scapularis* with somewhat better control usually obtained with liquid formulations. Sufficient spray volume and pressure should be used for thorough coverage and penetration of the vegetation and leaf litter. A small hand pump sprayer is unlikely to provide the coverage needed for good tick control and, at a minimum, some type of garden hose sprayer is suggested. A homeowner who wishes to apply a granular material with a fertilizer spreader for tick control may not be able to treat woodland margins effectively and the product may be labeled for lawn use only.
- Effectiveness in controlling ticks. Blacklegged ticks and American dog ticks are readily killed by almost all ornamental and turf insecticides labeled for tick control. With the withdrawal of the organophosphate insecticides chlorpyrifos and diazinon from residential use (the U.S. Environmental Protection Agency has cancelled registration of these compounds for residential area-wide use), the synthetic pyrethroid insecticides are the most commonly used tick control agents. Pyrethroids are particularly effective at rates 6-45 times less than the now cancelled organophosphate insecticides and the carbamate insecticide carbaryl. In the laboratory, nymphal *I. scapularis* crawling on landscape stones treated with pyrethrin-based desiccants and insecticidal soaps suffered high (> 88%) mortality. However, natural pyrethrin with the synergist piperonyl butoxide provided limited tick control in the residential landscape in several trials. By contrast, synergized pyrethrin was more effective when combined with insecticidal soap or as part of a silicon dioxide (from diatomaceous earth) product. Silicon dioxide acts as a desiccant. Thorough coverage appears particularly important with pyrethrin and insecticidal soap products. With the exception of a desiccant, there is little residual activity. At least two applications may be required.

Table 4. Acaricides with products labeled for the control of ticks in the residential landscape.

Chemical	Some brand or common names*	Chemical type and usage
Bifenthrin	Talstar® Ortho® product	Pyrethroid insecticide. Available as liquid and granular formulations. Products available for homeowner use and commercial applicators.
Carbaryl	Sevin®	Carbamate insecticide. A common garden insecticide for homeowner use, some products are for commercial use only.
Cyfluthrin	Tempo® Powerforce™	Pyrethroid insecticide. Available for commercial and homeowner use with concentrates and ready to spray (RTS) products.
Deltramethrin	Suspend® DeltaGard® G	A pyrethroid insecticide for commercial applicators.
<i>lambda</i> -cyhalothrin	Scimitar® Demand®	A pyrethroid insecticide for commercial applicators.
Permethrin	Astro® Ortho® products Bonide® products Tengard® SFR Others	Pyrethroid insecticide. There are concentrates and ready to spray (RTS) products. Most are for homeowner use, a few are for commercial use only.
Pyrethrin	Pyrenone® Kicker® Organic Solutions All Crop Commercial & Agricultural Multipurpose Insecticide®	Natural pyrethrins with the synergist piperonyl butoxide (PBO) or insecticidal soap provide limited tick control. A combination of pyrethrin and PBO with either insecticidal soap or silicon dioxide (from diatomaceous earth) was found effective against ticks in one trial.

*Active ingredients and brand names frequently change as new products are registered and others discontinued. New formulations for homeowner use may become available. Mention of a product is for information purposes only and does not constitute an endorsement by the Connecticut Agricultural Experiment Station.

Homeowner Application of Acaricides

One option is for the homeowner to make the pesticide application. Anyone applying pesticides to their own property should be familiar with how to read a pesticide label, how to correctly mix the pesticide, and follow the listed precautions in handling and applying the material. The pesticide label provides information on the active chemical ingredients, formulation, pests and sites for which it can be legally used, directions for use, precautions, hazards to humans, wildlife and the environment, and first aid instructions. Always read and follow pesticide label directions and precautions. It is a violation of federal law to use a pesticide in a manner inconsistent with the label. The label will provide an indication of how hazardous a pesticide is by the signal word on the label. Signal words are based on the EPA toxicity class and must be included on pesticide labels.

- Danger-Poison means highly toxic or poisonous through oral or dermal exposure
- Danger means highly toxic, but may include severe skin or eye irritants

- Warning means moderately toxic or hazardous
- Caution means slightly toxic or hazardous
- No signal word means practically nontoxic

Not all brands of a particular pesticide chemical will be labeled for area tick control. Some products may be for application in or on building and their immediate surroundings. Check the label. Homeowner products come in three forms.

- Ready-to-use (RTU) is premixed and applied directly from the existing container. They are used for spot treatments, treatments of individual plants, or treatment of small areas. Some RTU products, for example, are used to control dog ticks indoors or around a dog's bedding. Ready-to-spray (RTS) products are used for treating larger areas. The container attaches directly to a garden hose for automatic mixing of the water with the concentrate. For example, a ready spray of 2.5% permethrin or 0.75% cyfluthrin is available as a hose end sprayer for the control of *I. scapularis* and will cover about 5,000 square feet.
- Concentrates require mixing the product with water and using your own sprayer (pump-up style, hose-end style, or other type sprayer). Homeowner products may contain carbaryl, cyfluthrin, or permethrin.
- Granules are designed for lawn applications with a hand held or broadcast spreader. The chemical is usually released with addition of water, so granules generally must be watered in. Granules for tick control on the lawn may contain bifenthrin or carbaryl.

Appropriate protective gear as directed on the label should be used when applying pesticides. Surveys have shown many individuals fail to take precautions while applying pesticides. Store pesticides in a cool, dry, secure place. Keep them out of the reach of children. An EPA survey found 85% of households had at least one pesticide on the property and 47% with young children (under age 6) stored them within reach of the child. Keep a pesticide in its original container; do not store diluted spray. Either use up the product or properly dispose of leftover product through a community household hazardous waste program. Pesticides should never be poured down the sink or toilet. Empty containers should be triple rinsed and placed in the trash. For more information on handling, applying, storing and disposing of pesticides, readers may refer to the EPA's Citizen's Guide to Pest Control and Pesticide Safety (available at www.epa.gov).

Commercial Application of Acaricides

Another option is to have a licensed commercial pesticide applicator apply the acaricide. Most companies offering tick control services are lawn care, landscape, or tree care companies, but may include some pest control operators (PCOs) in some states, depending upon what licenses the operator has obtained. A survey of commercial applicators in Connecticut in the mid-1990s found that about 16% offered tick control services. The application of pesticides for tick control comprised less than 5% of their business for most companies. Nevertheless, most companies reported that tick control business had increased and a few companies have specialized solely in providing tick control. A follow-up survey by the author in 1999 indicated that 53% were now offering tick control services. A number of companies provide organically oriented pest management services.

A company offering commercial application of pesticides must be registered with the state or states in which they conduct business. A pesticide license is required for the commercial application of pesticides or the application of restricted use materials in the area. There must be at least one commercial supervisory pesticide applicator certified in the type of application being

made. In Connecticut, for example, a license for ornamental and turf application from the Department of Environmental Protection is required for applying pesticides for tick control in the landscape. Some tree service companies (arborists) also treat for ticks. Although arborists are tested and licensed by the state specifically for arboriculture services, they must also possess an ornamental and turf license to spray for ticks. Consumers should employ individuals who are licensed to spray for ticks and may request to see the license or license number or check with the agency responsible for the state pesticide program to see if the firms are properly registered and licensed. A commercial company should provide a consumer the name of the pesticide product to be used, the active ingredient in the product, the reentry period (the time before family members can safely reenter the treated area), and the form of the pesticide and type of equipment to be used. In most states, companies are required to provide copies of the label and material safety data sheets (MSDS). With this information, additional information can be obtained over the Internet, from local Cooperative Extension offices, state agencies and pesticide alternative groups. Tips on hiring an applicator are available from EPA's Citizen's Guide to Pest Control and Pesticide Safety (available at www.epa.gov). Some general guidelines about a pesticide application that homeowners and commercial applicators should be aware of include:

- Many states (including all New England states, New York, New Jersey, Pennsylvania) have notification laws that require customers or adjacent residents receive written notice prior to an urban pesticide application. Usually this notification is provided only to those who request it through a registry.
- Pesticides should not be applied on windy days (greater than 10 mph) to avoid drift to non-target areas.
- Before the spraying, the windows and doors of the home should be closed.
- Pesticides should be kept away from plants and play areas that you do not want treated. Most tick control pesticides are for ornamental and turf use only and are not labeled for use on plants meant for human consumption. Most of these chemicals are toxic to bees and should not be applied to areas with foraging bees.
- Pesticides should not be applied near (within 25 feet) wetlands (i.e. lakes, reservoirs, rivers, streams, marshes, ponds, estuaries, and commercial fish farm ponds) or near (within 100 feet) coastal marshes or streams. Even organic pesticides are toxic to fish and aquatic invertebrates.
- Family members and pets, especially cats, should be kept off the treated area for 12-24 hours or other specified reentry interval following the treatment (generally until a spray thoroughly dries).
- Do not water the lawn after the application of a pesticide to avoid run off (there are a few exceptions with some granular products which must be watered in). Do not apply within 24 hours of rain to avoid run-off. Once the pesticide has dried, however, some materials bind tightly to the soil or vegetation and do not readily move or wash off. They will breakdown with exposure to sunlight and soil microbes.
- Avoid pesticide applications near a wellhead. The shaft of the well should be tightly sealed and the well water source should be isolated from surface water source. Most acaricides used for tick control are water insoluble and pose little risk to wells by leaching through the soil, but direct exposure should be avoided.
- Many states (including all New England states, New York, New Jersey, Pennsylvania) have laws that require signs to be posted after an urban treatment is made.

An Acaricide Primer

The purpose of this section is to serve as a reference for some basic, general material on the major classes of chemicals used in tick control. More detailed information is available from the EPA, the Cooperative Extension Service, state pesticide agencies, and independent groups, particularly over the Internet. Some sources of information are listed at the end of this section. Acaricides belong to a variety of chemical classes, which differ in their chemistry, mode of action, toxicology, and environmental impacts. They also contain “inert ingredients,” chemicals that carry or enhance the application or effectiveness of the active ingredient (i.e., the actual acaricide). A variety of pesticides are also used in products to control ectoparasites on pets. Some pet care products are available over the counter and others through a veterinarian.

- **Organophosphates.** There were two organophosphate insecticides commonly used for area-wide tick control, chlorpyrifos (i.e., Dursban) and diazinon. The EPA has cancelled the residential use and some agricultural uses of chlorpyrifos and has cancelled the registration of diazinon for lawn, garden, and other residential outdoor use. Residential applications accounted for nearly 75% of the use of diazinon. Products with these chemicals are no longer used for tick control.
- **Carbamates.** Carbaryl (Sevin®) is the carbamate used in the control of ticks. Carbaryl is a broad-spectrum compound used for a wide variety of pests on the lawn, on pets, and in the home. Carbaryl in animals is readily broken down and excreted. It does not appear to cause reproductive, birth, mutagenic, or carcinogenic effects under normal circumstances, but it is a suspected endocrine disrupter. Carbaryl is extremely toxic to bees and beneficial insects, is moderately toxic to fish, but is relatively nontoxic to birds.
- **Pyrethrins.** Pyrethrum is a natural insecticide extracted from certain chrysanthemum plants. Natural pyrethrins are a group of six compounds that form the insecticidal constituents of the natural pyrethrum, which is highly unstable in light and air. Natural pyrethrins are considered knockdown agents because they rapidly paralyze insects, but many insects can detoxify the compound and recover. Therefore, pyrethrins are sometimes combined with a synergist. A synergist is a compound that enhances the toxicity of an insecticide, but is not an insecticide itself. The most common synergist used with pyrethrin is piperonyl butoxide, which inhibits the enzymes that breakdown pyrethrin. Pyrethrins also may be combined with insecticidal soaps, spreader sticker agents, silicon dioxide (desiccant) and other agents to enhance the effectiveness of the product. Pyrethrins have little residual effect, being quickly broken down by exposure to light, moisture, and air.
- **Pyrethroids.** Synthetic pyrethroids are derivatives of the natural compounds, chemically modified to increase toxicity and stability. Most of the chemicals used for area-wide tick control are pyrethroids. The pyrethroids are less volatile than the natural compounds and photostable, which provides some residual activity and greater insecticidal activity. Both pyrethrins and pyrethroids are highly toxic to fish and other aquatic organisms, but generally are much less toxic to mammals, birds and other wildlife. Pyrethroids can be skin and eye irritants. Many concentrated pyrethroid formulations are restricted to commercial use by licensed applicators because of their potential impact on aquatic organisms. However, low concentration, ready-to-use products are available for homeowner use.
- **Inert ingredients.** They may be solvents, propellants, spreaders, stickers, wetting agents, or carriers for the active pesticide chemical. Because these compounds are not the active chemical, they are labeled “inert ingredients” or sometimes “other ingredients”. These compounds often make up the major part of a pesticide formulation. In some cases, the

inert ingredients may be more toxic than the active ingredient. A few examples of inerts include naphthalene, petroleum distillates, and the organic solvents xylene and toluene.

- **Acaricides for control of ticks on pets.** Carbaryl and the pyrethroid permethrin are used in several flea and tick control products for dogs. Studies have indicated that use of permethrin products (i.e., K9 Advantix™, Kiltix®) can prevent the transmission of *B. burgdorferi* and *A. phagocytophilum*. Both are topical products applied to spots along or on the back of the animal. They are not for use on cats, as cats are particularly susceptible to pyrethrin poisoning. Fipronil, a phenylpyrazole, is the only commercial insecticide of this chemical type. Formulated pet products are available as a spray or topical spot application (Frontline®, Frontline® Top Spot™, Frontline® Plus) for long-term control of fleas and ticks on dogs and cats. It is the material used in the Maxforce® TMS rodent bait box. Fipronil dissolves in the oils on the skin, spreads over the body, and collects in sebaceous glands and hair follicles for long-term reapplication. It is not affected by bathing or water immersion. Skin irritation may occur. Fleas are killed from 1-3 months, while ticks are killed for about a month. Trizapentadiene or formamidene compounds include one currently used material, amitraz. In livestock, it is used to control ticks, mites, and lice. It is not a skin irritant, is not readily absorbed into tissue, and degrades rapidly in the environment. Amitraz is used in a tick prevention collar for dogs (Preventic®), and one study indicated it could prevent transmission of *B. burgdorferi*. An amitraz product was one of the compounds initially evaluated for the topical treatment of deer to control *I. scapularis*.

Additional sources of information about pesticides

Environmental Protection Agency (EPA) Public Information Center (telephone 202-260-2080), National Center for Environmental Publications and Information (telephone 513-489-8190), EPA booklets or the EPA web site (www.epa.gov).

National Pesticide Information Center (NPIC) (formerly the National Pesticide Telecommunications Network) is a cooperative effort of Oregon State University and the U.S. Environmental Protection Agency (EPA). The toll-free service is staffed 6:30 am – 4:30 pm Pacific time (9:30 a.m. – 7:30 p.m. Eastern time) 7 days week, except holidays (telephone 1-800-858-7378). Information provided by the NPIC includes pesticide information, information of recognizing and managing pesticide poisonings, safety information, health and environmental effects, referrals for investigation of pesticide incidents and emergency treatment information, and cleanup and disposal procedures. Pesticide related fact sheets and other information are available at the web site (<http://npic.orst.edu/>). Their address is NPIC, Oregon State University, 33 Weniger Hall, Corvallis, Oregon 97331-6502.

Extension Toxicology Network (EXTOXNET) is a cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho. Primary files are maintained and archived at Oregon State University. Pesticide Information Profiles (PIPs) and Toxicology Information Briefs (TIBs) provide information on pesticide trade names, regulatory status, acute and chronic toxicological effects, signs and symptoms of poisoning, ecological effects and environmental fate, physical properties, manufacturer, and references (<http://ace.orst.edu/info/extoxnet/>).

State pesticide regulatory agencies can provide information on the laws and regulations governing the application of insecticides, certification of pesticide applicators, and which products are registered for use in the state. Depending upon the state the agency may be associated with the state Department of Agriculture, Consumer Protection, or Environmental Protection.